

FS50SMJ-03

HIGH-SPEED SWITCHING USE

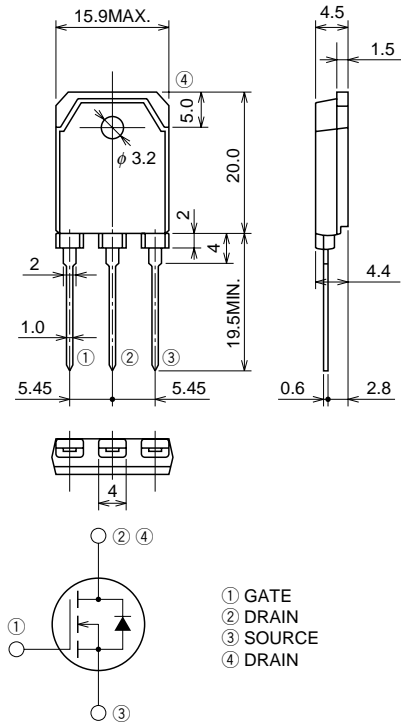
FS50SMJ-03



- 4V DRIVE
- V<sub>DSS</sub> ..... 30V
- r<sub>DS</sub> (ON) (MAX) ..... 19mΩ
- I<sub>D</sub> ..... 50A
- Integrated Fast Recovery Diode (TYP.) ..... 60ns

OUTLINE DRAWING

Dimensions in mm



TO-3P

APPLICATION

Motor control, Lamp control, Solenoid control  
DC-DC converter, etc.

MAXIMUM RATINGS (T<sub>c</sub> = 25°C)

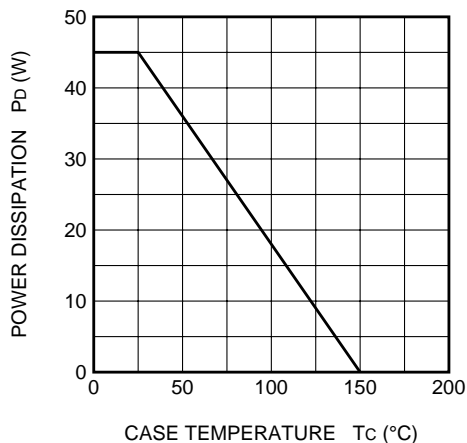
Symbol	Parameter	Conditions	Ratings	Unit
V <sub>DSS</sub>	Drain-source voltage	V <sub>GS</sub> = 0V	30	V
V <sub>GSS</sub>	Gate-source voltage	V <sub>DS</sub> = 0V	±20	V
I <sub>D</sub>	Drain current		50	A
I <sub>DM</sub>	Drain current (Pulsed)		200	A
I <sub>DA</sub>	Avalanche drain current (Pulsed)	L = 30μH	50	A
I <sub>S</sub>	Source current		50	A
I <sub>SM</sub>	Source current (Pulsed)		200	A
P <sub>D</sub>	Maximum power dissipation		45	W
T <sub>ch</sub>	Channel temperature		−55 ~ +150	°C
T <sub>stg</sub>	Storage temperature		−55 ~ +150	°C
—	Weight	Typical value	4.8	g

**ELECTRICAL CHARACTERISTICS** ( $T_{ch} = 25^{\circ}\text{C}$ )

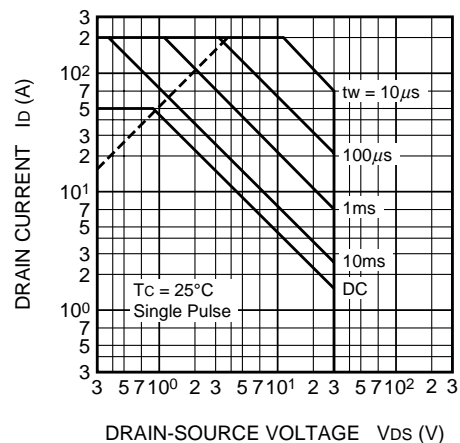
Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{mA}$ , $V_{GS} = 0\text{V}$	30	—	—	V
$I_{GSS}$	Gate-source leakage current	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$	—	—	$\pm 0.1$	$\mu\text{A}$
$I_{DSS}$	Drain-source leakage current	$V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$	—	—	0.1	mA
$V_{GS(th)}$	Gate-source threshold voltage	$I_D = 1\text{mA}$ , $V_{DS} = 10\text{V}$	1.0	1.5	2.0	V
$r_{DS(on)}$	Drain-source on-state resistance	$I_D = 25\text{A}$ , $V_{GS} = 10\text{V}$	—	15	19	$\text{m}\Omega$
$r_{DS(on)}$	Drain-source on-state resistance	$I_D = 25\text{A}$ , $V_{GS} = 4\text{V}$	—	21	35	$\text{m}\Omega$
$V_{DS(on)}$	Drain-source on-state voltage	$I_D = 25\text{A}$ , $V_{GS} = 10\text{V}$	—	0.375	0.475	V
$ y_{fs} $	Forward transfer admittance	$I_D = 25\text{A}$ , $V_{DS} = 10\text{V}$	—	28	—	S
$C_{iss}$	Input capacitance	$V_{DS} = 10\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	—	1600	—	pF
$C_{oss}$	Output capacitance		—	500	—	pF
$C_{rss}$	Reverse transfer capacitance		—	260	—	pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{V}$ , $I_D = 25\text{A}$ , $V_{GS} = 10\text{V}$ , $R_{GEN} = R_{GS} = 50\Omega$	—	17	—	ns
$t_r$	Rise time		—	90	—	ns
$t_{d(off)}$	Turn-off delay time		—	130	—	ns
$t_f$	Fall time		—	125	—	ns
$V_{SD}$	Source-drain voltage	$I_S = 25\text{A}$ , $V_{GS} = 0\text{V}$	—	1.0	1.5	V
$R_{th(ch-c)}$	Thermal resistance	Channel to case	—	—	2.78	$^{\circ}\text{C/W}$
$t_{rr}$	Reverse recovery time	$I_S = 25\text{A}$ , $di/dt = -50\text{A}/\mu\text{s}$	—	60	—	ns

**PERFORMANCE CURVES**

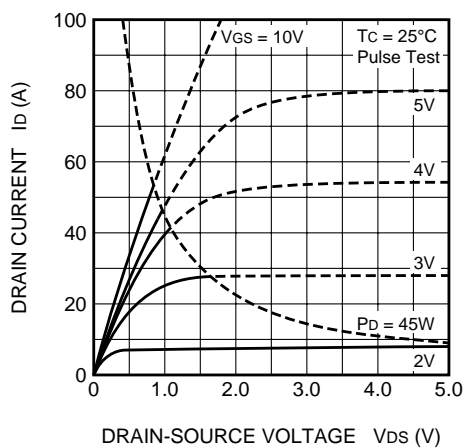
**POWER DISSIPATION DERATING CURVE**



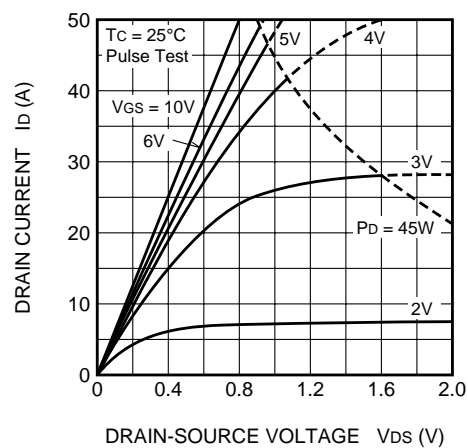
**MAXIMUM SAFE OPERATING AREA**



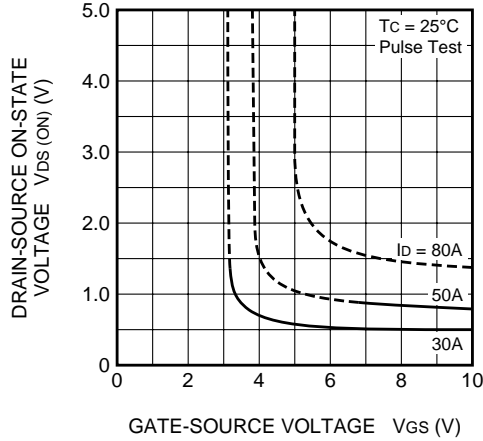
**OUTPUT CHARACTERISTICS (TYPICAL)**



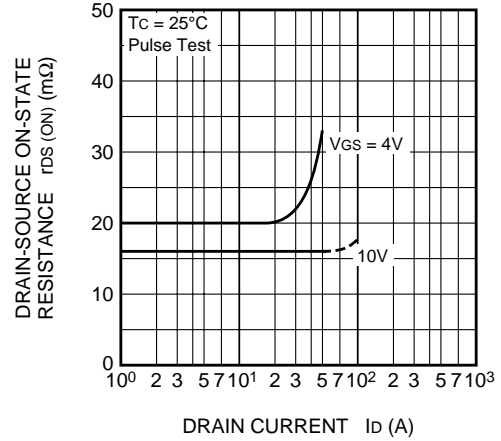
**OUTPUT CHARACTERISTICS (TYPICAL)**



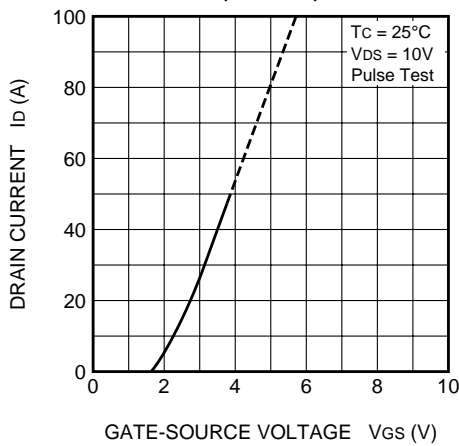
ON-STATE VOLTAGE VS.  
GATE-SOURCE VOLTAGE  
(TYPICAL)



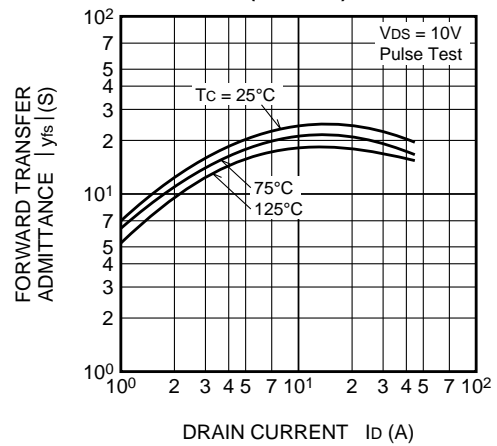
ON-STATE RESISTANCE VS.  
DRAIN CURRENT  
(TYPICAL)



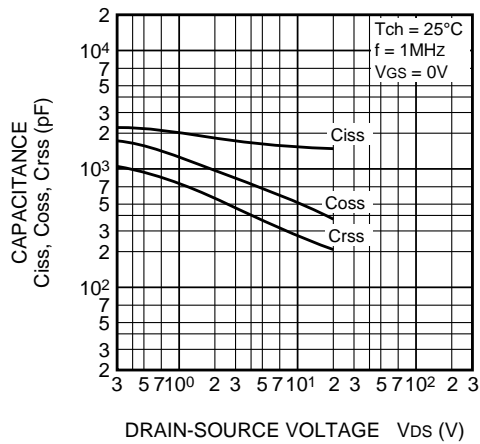
TRANSFER CHARACTERISTICS  
(TYPICAL)



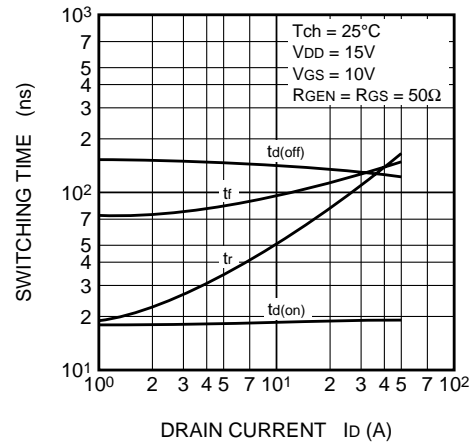
FORWARD TRANSFER ADMITTANCE  
VS.DRAIN CURRENT  
(TYPICAL)



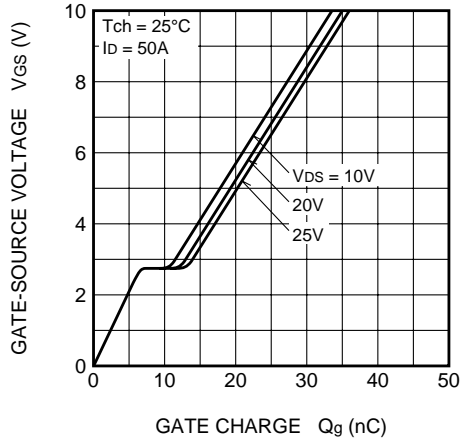
CAPACITANCE VS.  
DRAIN-SOURCE VOLTAGE  
(TYPICAL)



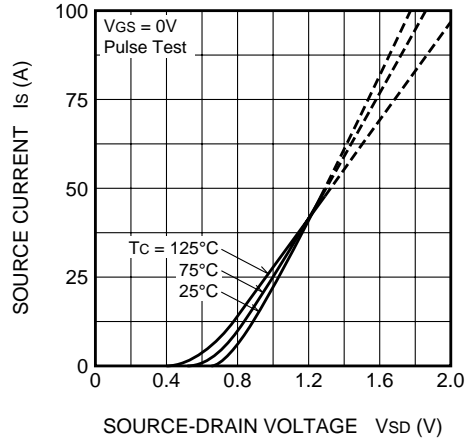
SWITCHING CHARACTERISTICS  
(TYPICAL)



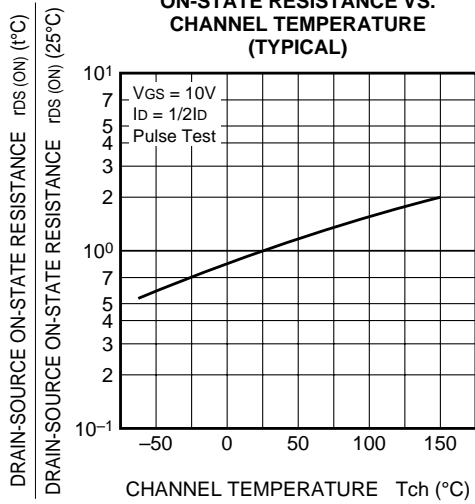
GATE-SOURCE VOLTAGE  
VS. GATE CHARGE  
(TYPICAL)



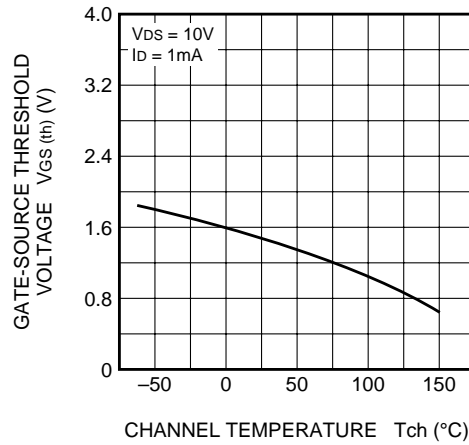
SOURCE-DRAIN DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



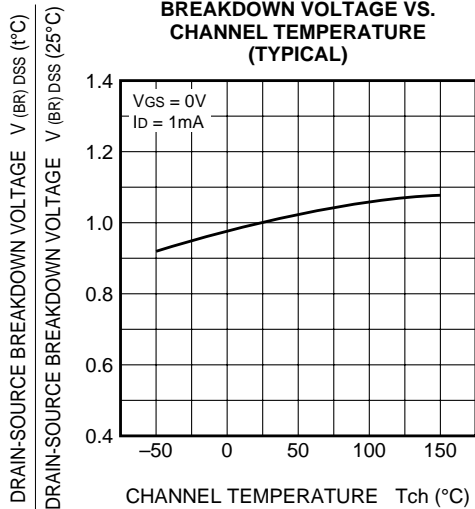
ON-STATE RESISTANCE VS.  
CHANNEL TEMPERATURE  
(TYPICAL)



THRESHOLD VOLTAGE VS.  
CHANNEL TEMPERATURE  
(TYPICAL)



BREAKDOWN VOLTAGE VS.  
CHANNEL TEMPERATURE  
(TYPICAL)



TRANSIENT THERMAL IMPEDANCE  
CHARACTERISTICS

